

18 September 2002
Application No.: 09/707, 710
Docket: 1029us

Could
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applied to seal the ferrule around the fiber since these packages must be hermetically sealed to ensure stable long-term operation. During the solder bonding processes, asymmetries can arise in the residual stress fields applied around the circumference of the fiber after the solder has cooled. These asymmetric stress fields lead to distortions in the stress-induced birefringent medium of the fiber. This results in coupling between the two polarization modes of the PM fiber that consequently degrade the PER of the system from that expected from the separate components. --

Replace the paragraph beginning at page 6, line 22, in the specification as originally filed, with the following rewritten paragraph:

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-- Fig. 7 is a perspective view showing the deformation of the mounting structure to rotationally align the fiber to the laser chip according to the present invention. --

Replace the paragraph beginning at page 7, line 4, in the specification as originally filed, with the following rewritten paragraph:

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-- Specifically, the system comprises a package 10. In the illustrated example, a butterfly package is used in which leads 14 extend laterally from the package. In other implementations, the invention can also be applied to DIP packages where the leads 14 extend orthogonally from the floor 12 of the package 10. --

Replace the paragraph beginning at page 7, line 8, in the specification as originally filed, with the following rewritten paragraph:

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--In the illustrated cooled laser system, a thermo-electric cooler 100 is installed on the floor 16 of the package 10. These coolers are typically driven in response to the temperature within the package, detected by thermistor 110 for example, to maintain a temperature-stable operating environment for the semiconductor laser chip. --

Replace the paragraph beginning at page 8, line 1, in the specification as originally filed, with the following rewritten paragraph:

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-- In the current embodiment, the diode 118 is laid-down on the bench 102. That is, the active surface 122 of the monitoring diode is in a plane that is parallel or substantially parallel to the surface of the bench 102. --

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Replace the paragraph beginning at page 8, line 10, in the specification as originally filed, with the following rewritten paragraph:

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-- The present invention has particular applicability to pump lasers incorporating Bragg grating stabilization where PM fiber is common. Specifically, in one implementation, the fiber pigtail 106 comprises a Bragg grating 128 that is formed in the fiber pigtail. --

Replace the paragraph beginning at page 8, line 16, in the specification as originally filed, with the following rewritten paragraph:

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-- Fig. 2 shows the details of the orientation of the semiconductor laser chip 114, the monitoring diode 116 and the fiber endface 126. Specifically, the double angle wedge shape fiber or other aspheric endface 126 is located in front of the stripe of the semiconductor chip 114 opposite the chip's front facet 124. --

Replace the paragraph beginning at page 8, line 23, in the specification as originally filed, with the following rewritten paragraph:

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-- Fig. 3 shows a mounting structure 104 that enables the PER compensation according to the present invention and the source of the potential first asymmetric stress field 210. Specifically, as is common, the PM fiber 106, which may have been previously metallized, is solder bonded (130) to the mounting structure 104, which secures the fiber 106 to the bench or submount 102. This solder bonding or other bonding process may result in an asymmetrical stress field being applied to the fiber 106, which degrades its PER. --

Replace the paragraph beginning at page 9, line 17, in the specification as originally filed, with the following rewritten paragraph:

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-- In the current embodiment, an active alignment process is then performed in step 714 in which the chip 114 is energized and the endface of the fiber is aligned relative to the exit facet of the chip. Either before or after this active aligning process, the fiber is secured in proximity to the submount or bench 102 using mounting structure 104. --

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Replace the paragraph beginning at page 9, line 21, in the specification as originally filed, with the following rewritten paragraph:

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-- As illustrated in step 716, as also part of the manufacturing process, the package is sealed around the fiber in the fiber feedthrough. In one implementation, solder material is filled in around the fiber in the ferrule. --

Replace the paragraph beginning at page 10, line 1, in the specification as originally filed, with the following rewritten paragraph:

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-- Fig. 6 is a schematic block diagram illustrating the manufacturing test system that is used to detect the PER of the system. Specifically, the semiconductor laser chip 114, which is installed on the bench 102 in the package 10, is energized. The generated polarized light is coupled in the fiber 106, which has been inserted into the package through the front wall 16 and secured to the bench 102 via mounting structure 104. Further, alignment has taken place, so that the endface 146 is held in relation to the front facet of the semiconductor laser such that a desired coupling efficiency has been achieved. Most importantly, all of the stresses that will be applied to the fiber as part of the manufacturing, exist. Specifically, solder 144 has been placed around the fiber 106 in the ferrule and the fiber is bonded to the mounting structure 104. --

Replace the paragraph beginning at page 10, line 11, in the specification as originally filed, with the following rewritten paragraph:

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-- Further, in a fiber stabilized pump scenario, a fiber Bragg grating 128 exists in the fiber pigtail 106 at some typically specified distance from the semiconductor chip 114. --

Replace the paragraph beginning at page 10, line 19, in the specification as originally filed, with the following rewritten paragraph:

A13
-- Thereafter, the endface 126 of the fiber is rotationally aligned to the semiconductor laser 114 in step 722. Specifically, by rotationally aligning the endface 126 of the laser, the angle at which the single polarization light is launched into the fiber